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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/067,212	02/07/2002	Keigo Mizutani	111920	6438

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EXAMINER

OLSEN, KAJ K

ART UNIT	PAPER NUMBER
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1753

DATE MAILED: 11/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/067,212

Applicant(s)

MIZUTANI ET AL.

Examiner

Kaj K Olsen

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 August 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-7, 10-13 and 15-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-7, 10-13, 15-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. Claims 2-7, 10-12, 15-21, 23-25, and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 01/02845.
3. Claims 2-7, 10-12, 15-21, 23-25, and 27-29 in the alternative are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 01/02845 in view of Kato et al (USP 5,877,406).
4. For the rejection, all references to the text of WO '845 will refer to the text of the English language disclosure of USP 6,495,027 (USP '027 is the English language equivalent of WO '845).
5. With respect to claims 11 and 12, WO '845 discloses a gas sensor element comprising a gas cavity 13 into which gasses consisting essentially of oxygen molecules and NO_x are admitted through a given dispersion resistance 23 (col. 3, lines 1-10). WO '845 also discloses an oxygen pump cell including an oxygen ion-conducting member 11a, a first pump cell electrode 29 and a second pump cell electrode 28 which is exposed to the gas cavity (fig. 2). Said oxygen pump cell being responsive to application of a voltage across the first and second pump cell electrodes to selectively pump oxygen molecules into and out of said gas cavity for adjusting a concentration of the oxygen molecules within said gas cavity to a desired value (col. 3, lines 40-65). WO '845 further discloses an oxygen monitor cell including an oxygen ion-conducting member 11c, a first monitor cell electrode 35 and a second monitor cell electrode 31 which is exposed to the gas cavity said oxygen monitor cell working to produce an electric signal

indicative of a concentration of the oxygen molecules within said gas cavity (col. 3, lines 16-18).

WO '845 also discloses a sensor cell including an oxygen ion-conducting member 11c, a first sensor cell electrode 35 and a second sensor cell electrode 33 which is exposed to said gas cavity said sensor cell working to produce an electric signal indicative of a concentration of the NO_x gas within said gas cavity (col. 3, line 66 through col. 4, line 16). WO '845 discloses a second oxygen monitor cell electrode and the second sensor cell electrode have ends oriented to an upstream side of the-flow of the gasses within said gas cavity (see fig. 1).

6. With respect to claim 11 and the limitation that one of the ends being offset from the other in a direction of the flow of the gasses by 2 mm or less, the examiner first points out that the "2mm or less" is being interpreted as not including 0 mm because of the claim term "being offset" implies some shift from 0 mm. In that respect, WO '845 does not appear to teach the presence of any shifting of the ends of the electrodes from each other. However, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to shift the electrodes by 2 mm or less because the mere rearrangement of parts has been held to be obvious (*In re Japikse* 86 USPQ 70). Figure 15 evidences that there does not appear to be any unexpected result (or even a benefit) from the use of a small shift. Furthermore, the specified small amount of shifting of the electrodes of WO '845 could unintentionally result from imperfections in the electrode printing process (e.g. slightly offset stencils), and one possessing ordinary skill in the art would recognize that these unintentional imperfections would still result in an operable sensor.

7. With respect to the new limitation requiring the gases to go through the same total diffusion resistance, it would have been obvious to one of ordinary skill in the art at the time the

invention was being made to utilize the same configuration of diffusion resistor for 25 and 27. This is because chambers 15 and 17 are supposed to have the same response to oxygen because the pump current from one of the oxygen sensor is utilized to subtract the oxygen contribution from the pump current of the NOx sensor. If the diffusion characteristics of each chamber differed, then the current due to oxygen concentrations would differ and the NOx sensor would be inaccurate.

8. Similarly with claim 12, applicant's specified "interval" is interpreted as not including 0 mm because the term "interval" implies some real gap. In that respect, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to allow for an interval of 1 mm or less because the mere rearrangement of parts has been held to be obvious (*In re Japikse* 86 USPQ 70). Figure 16 evidences that there does not appear to be any unexpected result (or even a benefit) from the use of an interval. Furthermore, the specified small interval of WO '845 could unintentionally result from imperfections in the electrode printing process (e.g. slightly offset stencils), and one possessing ordinary skill in the art would recognize that these unintentional imperfections would still result in an operable sensor.

9. With respect to the limitation about the first monitor cell electrode and the first sensor cell electrode, because WO '845 discloses a common electrode 35 that provides the specified electrode function of both cell electrodes (col. 3, lines 18 and 19), this would appear to meet the claim limitation. In the alternative, if this limitation is interpreted as requiring both electrodes to be separate electrodes, then WO '845 does not teach this limitation. However, Kato '406 discloses in an alternate NOx sensor that it was known in the art to provide either common reference electrodes or separate reference electrodes for each cell of the sensor (compare Kato

fig. 3b with 2b and col. 17, lines 37-48). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Kato '406 for the sensor of WO '845 because the equivalency of using either separate or common reference electrodes was known in the art. Furthermore, the use of separate known devices to provide the functions that a common device previously provides requires only routine skill in the art.

10. With respect to the presence of a reference cavity, see col. 2, lines 58-65.
11. With respect to the various applied voltages or the various workings or responsiveness of the cells, that is only the intended use of the apparatus and the intended use need not be given further due consideration in determining patentability.
12. With respect to the presence of a partition, see fig. 1 and col. 3, lines 3-11.
13. With respect to the electrode compositions, see col. 3, lines 20-32.
14. With respect to claims 15 and 27, the electrodes of WO '845 overlap each in the vantage point of looking into the drawings of fig. 2 and 3. That direction is perpendicular to the direction of gas flow. However, see alternative rejection below.
15. With respect to the second rectangular pump electrode, see fig. 1.
16. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO '845 (with or without Kato '406) in view of Kato et al (USP 6,045,673).
17. WO '845 with or without Kato '406 set forth all the limitations of the claims, but did not explicitly disclose an embodiment where the oxygen monitor cell and sensor cell are in the same second chamber. Kato '673 discloses an alternate sensor that teaches that although oxygen monitor cells may be placed in separate chambers (like WO '845), the oxygen cell can be placed in the same measuring chamber as the sensor cell resulting in miniaturization of the sensor cell.

Compare fig. 4 with fig. 8 of Kato '673 and see col. 25, lines 7-23. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Kato '673 for the sensor of WO '845 (with or without Kato '406) in order to provide for further miniaturization of the sensor.

18. Claims 13 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO '45 (with or without Kato '406) in view of Sugiyama et al (USP 6,332,965).

19. WO '845 with or without Kato '406 set forth all the limitations of the claims, but did not explicitly recite the presence of an air-fuel ratio sensor. Sugiyama teaches in an alternate NOx sensor that an air-fuel ratio sensor can be added to an existing sensor to provide a measurement of the air-fuel ratio in addition to the NOx measurement. See col. 10, line 65 through col. 11, line 45. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Sugiyama for the sensor of WO '845 (with or without Kato '406) in order to increase the utility of the sensor to a measurement of oxygen concentration (i.e. air-fuel ratio) as well.

20. Claims 15 and 27 are rejected in the alternative under 35 U.S.C. 103(a) as being unpatentable over WO '845 (with or without Kato '406) in view of Maurer et al (USP 4,283,261).

21. WO '845 set forth all the limitations of the claim (see rejection above). However, the examiner suspects that these claims were meant to read on the overlapping of electrodes in the manner shown in fig. 4(c) and 4(d) of the instant invention. However, the use of overlapping electrode configurations, such as interdigitated, is well known in the art. This is demonstrated by Maurer where a number of known overlapping configurations are shown (see fig. 3-5). An

interdigitated configuration would ensure that the two electrodes would be exposed to the exact same gas atmosphere and it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Maurer for the sensor of WO '845 (with or without Kato '406) in order to ensure that the electrodes are exposed to the exact same gas space.

Response to Arguments

22. Applicant's arguments filed 8-17-2004 have been fully considered but they are not persuasive. Applicant urges that there is no teaching in WO '845 (i.e. Stahl) of placing the electrodes in-line. With respect to the figures, applicant urges that the figures "merely appear to place the sensors in-line". This is not persuasive. To the examiner, this argument is essentially urging one to not believe what they see. WO '845 clearly shows in the figures that the electrodes are in-line with each other and there is no discussion in WO '845 that would give any indication that one wouldn't do what the figures show. Although the examiner appreciates that some aspects of the drawings cannot be relied on for teachings (e.g. drawing scale or size), the examiner does not believe those aspects apply here. In addition, even if the examiner entertained the notion that WO '845 is not teaching the use of "in-line" electrodes, one possessing ordinary skill in the art would have been motivated to utilize electrodes that are in alignment. In particular, electrodes 31 and 33 are drawn to electrodes that are configured to provide identical oxygen responses. This is because the current from the oxygen electrode 31 is utilized to subtract the oxygen response of the NOx electrode 33. See col. 4, lines 1-9. If these electrodes do not provide identical oxygen responses, the NOx measurement will be inaccurate because too

much or too little current will be subtracted from the current at the NO_x electrode. Hence, one possessing ordinary skill in the art would recognize that both chambers 15 and 17 should be as structurally identical as possible with as identical electrode placements as possible because differences in the gas diffusion properties (which stems from the chamber dimensions and electrode placement) of the chambers would lead to measurement inaccuracies.

23. With respect to the applicant's "offset", what fig. 14(b) through fig. 16 and p. 28, line 18 through p. 29, line 21 appear to be drawn to is what tolerances of offset are deemed acceptable. Applicant provides no benefit to offsetting the electrodes and would in fact lead one possessing ordinary skill in the art away from offsetting them at all. In particular, applicant urges that "[i]t is essential to arrange the electrode 3a of the oxygen sensor cell 3 and the electrode 4a of the sensor cell 4 at the same location in the direction of the flow of the gasses" (p. 28, lines 20-22). The accuracy gets worse the more the electrodes are offset from each other. Finding the appropriate tolerances ^{for} ~~from~~ how much electrode offset is deemed acceptable is not a patentable distinction over the prior art.

24. With respect to the rejections relying on Kato '673, applicant urges that the teaching of Kato '673 would not contribute to the miniaturization of the sensor because it would merely result in the removal of the partition. This is not persuasive. In particular, WO '845 teaches a sensor that has a particular width because the sensor has to accommodate the widths of 15, 17 and the partition. More specifically, chamber 13 and electrode 28 of WO '845 are as wide as the total width of 15, 17 and the partition. If one removes the partition, chamber 13 and electrode 28 need only be as wide as the width of electrodes 31 and 33. See Kato '673, fig. 7 where chamber 20 (equivalent to the chamber 13 of WO '845) is only as wide as the width of chamber 80

(equivalent to chambers 15 and 17). Hence the sensor can be constructed smaller. The examiner would further urge that combining chambers 15 and 17 together also eliminates the need for duplicate diffusion barriers 25 and 27 (Kato '673 only needs one diffusion barrier 16). This would simplify sensor construction and eliminate the possibility of barriers 25 and 27 functioning differently.

25. Applicant further urges that WO '845 does not teach minimizing a change in the concentration of oxygen around the monitor cell and the sensor cell. First, the examiner disagrees because the whole principle of WO '845 relies on the fact that the oxygen monitored in one of the cells can be utilized to subtract the oxygen contribution in the other cell. If oxygen levels differ between the two chambers, the NO_x measurement would be inaccurate. Second, the examiner fails to appreciate how this distinction has been claimed. The examiner cannot find anything claimed about minimizing changes between the two cells. In fact, applicant's claiming of the electrodes being "offset" from zero reads away from said minimization of oxygen changes.

Conclusion

26. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after

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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kaj Olsen whose telephone number is (571) 272-1344. The examiner can normally be reached on Monday through Thursday from 5:30 A.M. to 3:00 P.M. and on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen, can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AU 1753
November 9, 2004


KAJ K. OLSEN
PRIMARY EXAMINER